

## DRAWINGS ATTACHED

- (21) Application No. 46066/70 (22) Filed 28 Sept. 1970  
 (31) Convention Application No. P 19 49 521.7  
 (32) Filed 1 Oct. 1969 in  
 (33) Germany (DT)  
 (45) Complete Specification published 20 Sept. 1972  
 (51) International Classification B26B 19/04  
 (52) Index at acceptance  
       B4B 41 42  
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## (54) ELECTRIC RAZOR

(71) We, ROBERT KRUPS, a German Kommanditgesellschaft, of 29, Heresbachstrasse, 565 Solingen-Wald, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to an electric razor.

Electric razors in general have been found to suffer from the drawback that it is impossible to provide an optimum cutting tool for each user, since the facial skin of each user is likely to react differently to shaving, depending on the nature of the beard and the sensitivity of the skin. If a razor is, therefore, designed so that sensitive skin suffers no irritation or only slight irritation on shaving, then a user with non-sensitive skin and a stronger beard will find that a shave takes considerably longer and is relatively superficial. Hence attempts have already been made to adapt the shaving properties of electric razors to the skin and beard of the user by providing an extensible arrangement of the cutting tools, so that the skin penetrates into the cutting members to a varying depth according to the adjustment at the cutting edges. However, such adjustment of the cutting tools necessitates a complex adjusting device for the cutting head, and the basic cutting properties are still only changed to a limited extent. Moreover, such adaptation to the cutting properties of the user entails using a relatively rigid cutting foil, and experience shows that in that case a negative effect on the cutting properties must again be expected, particularly after long use.

According to the invention, an electric razor comprises a cutting member movable by an electric motor drive, a frame removably arranged over the cutting member, detachable securing means on the frame for a cutting foil to interact with the movable cutting member, and a plurality of cutting foils with dif-

ferent cutting properties for selective insertion in the frame.

The invention enables the user himself to select and insert in the razor the most favourable cutting foil to give him an optimum shave, i.e. to obtain the shortest possible shaving time and maximum protection of the facial skin.

For optimum adaptation of the razor to the skin and beard properties of any given user it is desirable for the plurality of cutting foils for insertion in the frame over the movable cutting member to differ from one another in thickness and/or in the width of the apertures therein for the passage of the hairs and/or in the distance between the said apertures. The cutting properties of the razor may be changed by using cutting foils differing only in thickness or foils differing only in the width of the apertures for the hairs. Of course, it is also possible for both the thickness of the foils and the width and spacing of the hair apertures to be altered simultaneously.

In order to produce a noticeable change in cutting properties, it is advisable to vary the widths of the hair apertures in the different types of foil in stages of about 0.01 mm, while the thickness of the foils can advantageously be graduated in stages of about 0.01 mm.

Finally, adequate variation in cutting properties may be obtained by modifying the spacing between the hair apertures in stages of about 0.05 mm.

The invention is diagrammatically illustrated by way of example in the accompanying drawings, in which:—

Figure 1 is a perspective view of a dry-shave razor according to the invention with the cutting head open;

Figure 2 is a plan view of a cutting foil adapted to be inserted in the frame of the cutting head;

Figure 3 is a plan view showing parts of two cutting foils with differently sized aper-

tures therein for the passage of hairs to be cut, and

Figure 4 is a section through a part of each of two cutting foils of different thick-

Figure 1 shows a dry-shave razor 10, a case 11 of which may be constructed in known manner and closed at the top by an end plate 12. Through the end plate 12 projects a drive member which can be caused to oscillate by an electric motor drive accommodated in the case 11, for example, an oscillating armature motor. A blade block 13 forming a movable cutting member is supported on the drive member in known manner. When the electric motor drive is switched on the blade block 13 is set in rapid, longitudinally reciprocating motion by means of the drive member.

The razor 10 is further provided with a frame 14 for a cutting foil 15 interacting with the blade block 13. The frame is mounted for pivoting movement on a spindle 16 arranged at one narrow side of the razor and can be lowered over the blade block 13 into the operating position; a catch lug 17 provided at the end of the frame 14 remote from the spindle 16 can engage an opposed catch member 18 on the case in a position of use and thus secure the frame 14. In order to raise the frame 14 into the open position shown in the drawing, the opposed catch member 18 can be freed from the catch lug 17 by pressing a button 19. The frame 14 is provided at its narrow sides with elevated side pieces 21, which have curved upper edges 20.

The frame 14 is provided with downwardly open, longitudinal supports in which the longitudinal sides of a cutting foil to be used may be inserted. A clamping yoke 22 is provided to secure the cutting foil 15 to the frame 14. The ends of the clamping yoke 22 are supported on the spindle 16 of the frame 14 so that the yoke 22 can be pivoted away from the frame 14. The yoke 22 may be engaged with the catch lug 17, by slightly deforming the member of the yoke forming the side opposite to the spindle 16, in order to secure the foil.

Figure 2 shows that the cutting foil 15 is held to the frame 14 by means of rod-like reinforcing members 23, which are provided at the longitudinal sides of the foil 15 and extend beyond the ends thereof. In this way, the cutting foil 15 can be inserted in the frame 14 in a curved state and its narrow sides remain freely movable, so that the foil 15 retains a high degree of elasticity while the razor is in operation.

Apart from the cutting foil 15 which is clamped into the frame 14 in Figure 1, other cutting foils with varying cutting properties are associated with the razor. Where necessary the foil 15 which is clamped into the frame 14 in Figure 1, may be replaced

by one of a variety of other foils. For this purpose the user need only pivot the yoke 22 away from the frame 14, take out the cutting foil therein, insert a foil more suitable for himself in the supports of the frame 14 and secure the foil therein by pivoting the yoke 22 into its closed position.

The cutting properties of the razor 10 can thus easily be adapted to the individual requirements of the user by the optional insertion of one of the associated cutting foils in the frame 14. The various foils are varied in respect of the width and/or spacing of their apertures and in respect of their thickness, and the cutting properties can be influenced by varying any or all of the above properties. As a further explanation, cut-out portions from two cutting foils 25, 26 producing different cutting properties in the razor and differing from one another in the width of the apertures through which the hairs to be cut can pass are shown in Figure 3. Foil 25, contains relatively small apertures 27, and permits a gentler shave than foil 26 which contains wider apertures 28. The shape of the apertures is the same in both cases, namely such that a basically square shape is substantially obtained, although corner portions are broken by short edges. As a measure of the width of the apertures, the edge length  $l$  thereof may be chosen as 0.5 mm for the foil 25 and 0.6 to 0.7 mm for the foil 26. The edge length  $l$  may, however, be either larger than 0.7 mm or smaller than 0.5 mm. To produce the desired change in cutting properties, the edge length should vary by 0.01 mm in successive sizes, the lower limit for the edge length  $l$  at which a shave is still possible being approximately 0.25—0.30 mm.

Adjacent longitudinal sections through two cutting foils 29, 30 are shown in Figure 4, in which the thickness of the foil, i.e. the thickness in the region of connecting webs 31 varies from one case to the other. As the connecting webs have slight curvature on top whereas on the underside they are drawn in behind the edges 32 interacting with the blade block, the thickness of the foil is shown as  $a$ . A thickness of from 0.05 to 0.055 mm is chosen for the thinner cutting foil 29, while an increase in thickness to 0.06 to 0.065 mm is chosen for the thicker foil 26, producing a more gentle shave. The thickness may be graduated in this way, either upwardly or downwardly, for other foils to produce a noticeable change in the cutting properties of the razor.

Finally, the width of the connecting webs 31 of the cutting foil and thus the distance between the apertures through which the hairs pass can be made larger or smaller, in order to permit a proportionally more gentle or more vigorous shave. For this purpose it is advisable for the distance between the aper-

tures to be graduated in lengths of approximately 0.05 to 0.1 mm.

As already mentioned, the construction illustrated is only an example of the invention; the invention is not restricted to this, and many variations and other embodiments are possible. Thus the razor may be provided with a differently shaped cutting member, in which case the frame receiving the cutting foil may be removable by a different method. It is also possible for the clamping yoke to be replaced by other known means for securing the cutting foils. In certain cases the shape of the apertures through which the hairs pass may need to be modified. For instance, the edges of the apertures could merge via concave curved portions.

#### WHAT WE CLAIM IS:—

1. An electric razor comprising a cutting member movable by an electric motor drive, a frame removably arranged over the cutting member, detachable securing means on the frame for a cutting foil to interact with the movable cutting member, and a plurality of cutting foils with different cutting properties for selective insertion in the frame.
2. An electric razor according to claim 1,

in which the plurality of cutting foils for insertion in the frame over the movable cutting member differ from one another in thickness and/or in the width of apertures therein through which the hairs pass and/or in the distance between said apertures.

3. An electric razor according to claim 2, in which the width of the apertures for the passage of the hairs in the various types of cutting foils is graduated by approximately 0.01 mm.

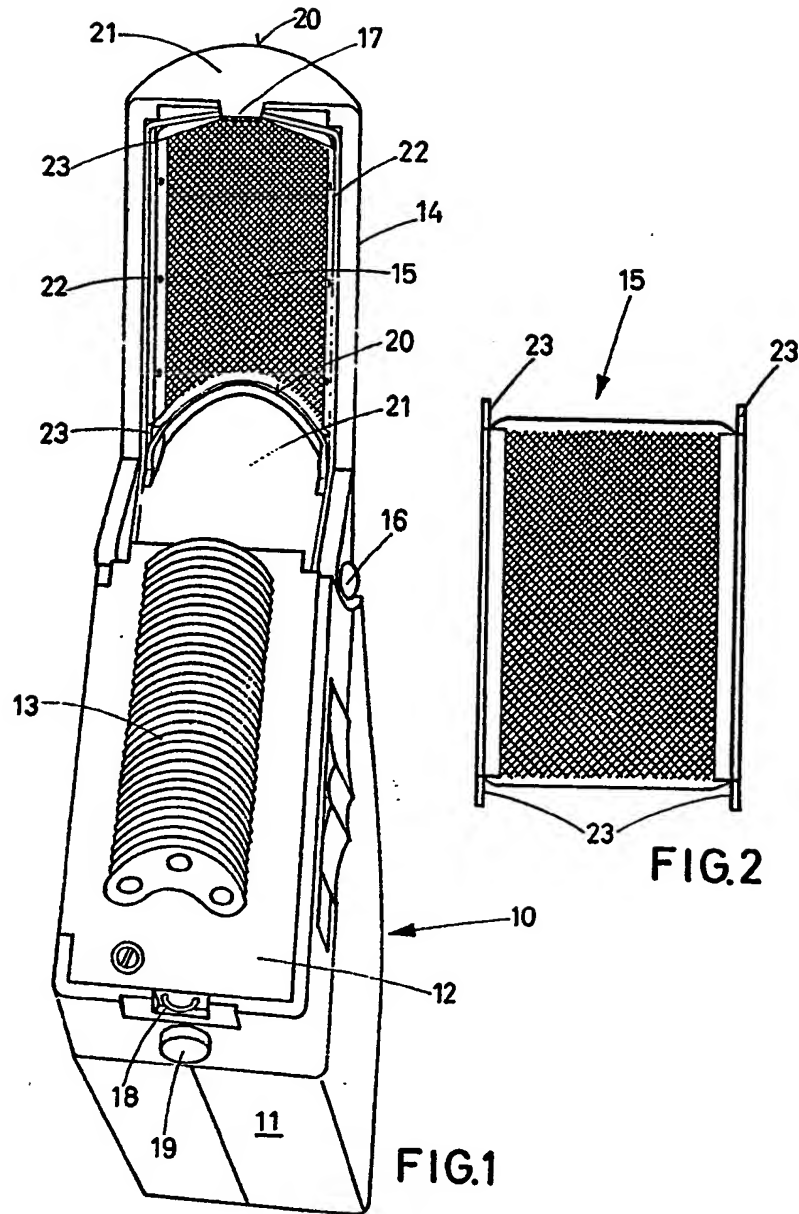
4. An electric razor according to claim 2, in which the thickness of the cutting foils is graduated by approximately 0.01 mm.

5. An electric razor according to claim 2, in which the distance between the apertures for the passage of the hairs is graduated by approximately 0.05 mm.

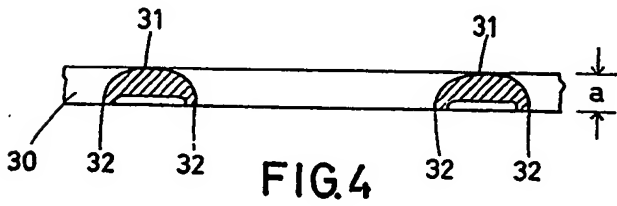
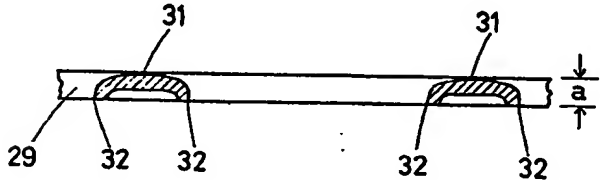
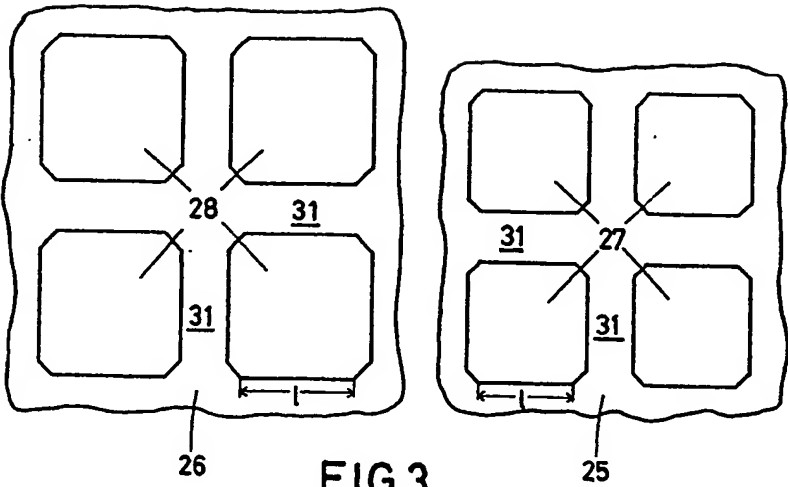
6. An electric razor substantially as hereinbefore described and illustrated with reference to any of the accompanying drawings.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1972.  
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



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